

Class schedule: Math 4110, Fall 2025

- **Week 1.**
 - **Wed. 8/20:** Course intro, history of combinatorics.
 - **Fri. 8/22:** Four ways to count.
- **Week 2.**
 - **Mon. 8/25:** The pigeonhole principle.
 - **Wed. 8/27:** Induction.
 - **Fri. 8/29:** Strong induction, basic counting.
- **Week 3.**
 - **Mon. 9/1:** No class (Labor Day).
 - **Wed. 9/3:** Acyclic orientations, permutations, and subsets.
 - **Fri. 9/5:** Generating functions for subsets. Compositions.
- **Week 4.**
 - **Mon. 9/8:** Multisets.
 - **Wed. 9/10:** Binomial theorem and combinatorial reciprocity.
 - **Fri. 9/12:** Ehrhart theory.
- **Week 5.**
 - **Mon. 9/15:** Multinomial coefficients.
 - **Wed. 9/17:** The twelvefold way.
 - **Fri. 9/19:** Set partitions.
- **Week 6.**
 - **Mon. 9/22:** Integer partitions.
 - **Wed. 9/24:** Integer partitions and generating functions.
 - **Fri. 9/26:** Probability generating functions, cycles in permutations.
- **Week 7.**
 - **Mon. 9/29:** Cycles in permutations.
 - **Wed. 10/1:** Stirling numbers, the fundamental bijection.
 - **Fri. 10/3:** Inversions in permutations.
- **Week 8.**
 - **Mon. 10/6:** Cycles in permutations.
 - **Wed. 10/8:** Eulerian statistics.
 - **Fri. 10/10:** Mahonian statistics.
- **Week 9.**
 - **Mon. 10/13:** No class (Fall Break).
 - **Wed. 10/15:** Coxeter groups and signed permutations.
 - **Fri. 10/17:** Midterm 1.
- **Week 10.**
 - **Mon. 10/20:** Coxeter groups and signed permutations.
 - **Wed. 10/22:** Catalan numbers (generating functions).
 - **Fri. 10/24:** Catalan numbers (enumeration).

- **Week 11.**
 - **Mon. 10/27:** Parking functions.
 - **Wed. 10/29:** Noncrossing partitions, Tamari lattices, the graph Laplacian.
 - **Fri. 10/31:** The matrix-tree theorem.
- **Week 12.**
 - **Mon. 11/3:** Cayley's formula for trees.
 - **Wed. 11/5:** Chip firing and the critical group.
 - **Fri. 11/7:** Dhar's burning test, superstability, G -parking functions.
- **Week 13.**
 - **Mon. 11/10:** Deletion and contraction.
 - **Wed. 11/12:** The Tutte polynomial.
 - **Fri. 11/14:** Duality, flow polynomials, matroids.
- **Week 14.**
 - **Mon. 11/17:** Uniform matroids, Kruskal's algorithm, poset fundamentals.
 - **Wed. 11/19:** Chains, antichains, rank generating functions.
 - **Fri. 11/21:** Lattices, order ideals, and Birkhoff's theorem.
- **Week 15.**
 - **Mon. 11/24:** Classical Möbius inversion: inclusion-exclusion, Euler's totient.
 - **Wed. 11/26:** No class (Thanksgiving break).
 - **Fri. 11/28:** No class (Thanksgiving break).
- **Week 16.**
 - **Mon. 12/1:** Incidence algebras, the zeta and Möbius functions
 - **Wed. 12/3:** Midterm 2.
 - **Fri. 12/5:** Möbius inversion and applications.